

February 2020

Rock River Valley Section

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Event

Sense

The Institute of Electrical and Electronic Engineers, Inc.

IEEE RRV Section, PELS Chapter Meeting

SERVING IEEE MEMBERS OF NORTH CENTRAL ILLINOIS AND SOUTH CENTRAL WISCONSIN

WHEN Thursday, February 27, 2020

WHERE

Rock Valley College
Woodward Tech Center
Room: WTC1310
3301 North Mulford Road
Rockford, IL 61114

AGENDA

6:00 PM Networking
6:30 PM Dinner
7:15 PM Presentation



Reaching the Full Potential of Integrated Machine Drives

Thomas M. Jahns, Grainger Professor of Power Electronics and Electric Machines

Power electronics is an appealing target for physical integration with electric machines, motivated by desires to achieve mass, volume, and cost savings via elimination of special enclosures and connecting cables. Despite some notable successes dating back to the 1960s, there have been a number of formidable obstacles that have limited the successful adoption of this integration technology, including the inability of power electronics to tolerate the thermal and vibration extremes imposed by the machines. Despite these challenges, continuing advances in power electronics (PE) technology are progressively suppressing the barriers to successful integration. Key among these is the accelerating maturity of wide-bandgap (WBG) power semiconductor switches (SiC and GaN) that offer exciting prospects for shrinking the size of power converters by significantly raising their operating frequencies. This presentation explores the future of integrated motor drives (IMDs) by first reviewing key applications and motivating factors that are spurring new research in this field. Looking ahead, the case will be made for a revival of interest in current-source inverters (CSIs) for future machine drives, highlighting the potential of new WBG power switches to update a technology that has been largely dormant for the past 30+ years. The objective is to simultaneously address EMI, temperature, voltage overshoot, and fault-mode limitations of today's dominant voltage-source inverter (VSI) machine drives. Progress made to date towards achieving these appealing advantages will be highlighted. The presentation will conclude with a review of both the opportunities and challenges presented by emerging technologies for realizing the full potential of the integrated motor drive vision during coming years.

Thomas M. Jahns received his bachelors, masters, and doctoral degrees in electrical engineering from MIT, Cambridge, MA (USA). Dr. Jahns joined the faculty of the University of Wisconsin – Madison (USA) in 1998 as a Grainger Professor of Power Electronics and Electric Machines in the Department of Electrical and Computer Engineering. He is the Director of the Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC), a university/industry consortium with over 85 international sponsors. Prior to coming to UW-Madison, Dr. Jahns worked at GE Corporate Research and Development in Niskayuna, NY (USA) for 15 years, where he pursued new power electronics and motor drive technology in a variety of research and management positions. His current research interests at UW-Madison include integrated motor drives and multiple forms of electrified propulsion, including on- and off-road electric vehicles and electric aircraft propulsion. Dr. Jahns is a Fellow of IEEE. He received the 2005 IEEE Nikola Tesla Technical Field Award "for pioneering contributions to the design and application of AC permanent magnet machines". Dr. Jahns is a Past President of the IEEE Power Electronics Society and the recipient of the 2011 Outstanding Achievement Award presented by the IEEE Industry Applications Society. He was elected to the US National Academy of Engineering in 2015.

MEAL INFORMATION

Dinner entrée will feature your choice of Vegetarian or Non-Vegetarian meals.

Members & Student Members: FREE,
Non-members: \$10,
Student non-members: \$5
Presentation only: FREE

Please register online at

<https://meetings.vtools.ieee.org/m/221544>

or by emailing Diane Sennebogen at diane.brock@utas.utc.com by Thursday, <Month> <Day> at 1 pm. Please include the following: name, phone number, email address, and IEEE member number. The meeting is open to the general public.